reef fishes. He finds that their fixed colors, excepting red, repeat the dominant color of the surroundings, and that the change of color in moving from place to place is induced by, and on the whole in accordance with, the nature of the places into which they go.

When the following varieties of color are possible to the individuals of a given species, cross-banded markings are likely to be shown when at rest, and longitudinal or self-colored phases when about to move or when actually moving.

To the fact of change of color when moving horizontally, the author adds the observation that there are similar definite phases of color change in some fishes for vertical movement. A vertical change of even a few inches may be followed by definite changes of color. The author feels that some of the changes of color usually charged as being connected with mating are probably so to be considered only because of place changes at the reproductive season, rather than as directly related to reproduction.

GLYCOGEN IN THE NERVOUS SYSTEM

Gage (J. Comp. Neur. June 1917) uses the methods of microchemical analysis to determine the presence and quantity of glycogen in the nervous system of Vertebrates. He finds abundant glycogen in the cells of the nervous system, at some stage of development, in all groups of vertebrates from amphioxus to mammals. Amphioxus, the lamprey, Amblystoma, the chick, and the pig were carefully studied. Glycogen is also found plentifully in sensory epithelia and in related organs.

The author feels from his results that glycogen is an essential accompanier of the development of nervous (and all other) tissues, especially in their functional stages;—being produced and used by the protoplasm as an essential feature of its metabolism. After the tissues, nervous and other, reach their final form this glycogenic function, as we know it in the higher forms, may be given up largely by the various tissues, and be taken over by the liver and the muscles.

EFFECT OF STRAIN ON DEVELOPMENT OF BONE

Howell (Anat. Rec. Vol. 13, Oct. 1917) produces paralysis of the muscles working the bones of the arm and shoulder by cutting the main nerves of the brachial plexus in young puppies. This removed

the stresses usually experienced by these bones. The results show definitely that the strains put upon the bones by the muscles are not necessary to the growth of the bones. Such unstressed bones grew as much as 56% to nearly 100% in four and one-half months. On the other hand bones unstressed by muscles were much smaller in diameter, in the thickness of compacta, in the sizeof the trabeculae; were reduced in weight and in their resistance to crushing. Growth in length seems little influenced.

EPITHELIAL MOVEMENTS IN VITRO

Shinichi Matsumoto (Jour. Exp. Zool. Vol. 26, Aug. 1918) reports experiments in the culture of corneal epithelium of adult frogs *in vitro*. This is a favorable material because the transparency of the cornea is such as to allow direct observation of the cell movements. Various substrata were used—as flat surfaces of glass, celloidin, and dead cornea; spider web, silk fiber, glass wool, asbestos fiber; and porous bodies, such as thin pieces of pith.

The movements are amoeboid, with the cells tending to cling to their own kind and thus to form sheets. This is a most essential quality in forming and extending epithelial surfaces. The author believes this to be thigmotactic rather than chemotactic in nature, extending as they do over various types of surfaces. Rapid extension of epithelium may thus take place with no mitotic divisions at all.

The same author (Jour. Exp. Zool. Oct. 1918) discusses the technic and results of vital staining of these corneal cells in neutral red. When this was done by immersing the whole animal in a weak solution (1:100,000 to 1,000,000) the excised cells behaved in vitro just about as the unstained cells do, and were more readily followed because of the distinctness of the granules in the cytoplasm.

The corneal epithelium, incidentally, showed clear phagocytosis of the pigment of broken iris cells and of finely powdered granules of various stains.

ENTOMOLOGICAL ABSTRACTS

Physiology of Chironomus Larva.—In a study of the biology and physiology of the larva of *Chironomus gregarius*, Pause (1918, Zool. Jahrb., Abt.f. all. Zool. u. Physiol., 36:339-452) finds, among other things, that this larva has four molts. Tracheae, absent in the first instar, appear in the second, and are confined to the head and thorax.